

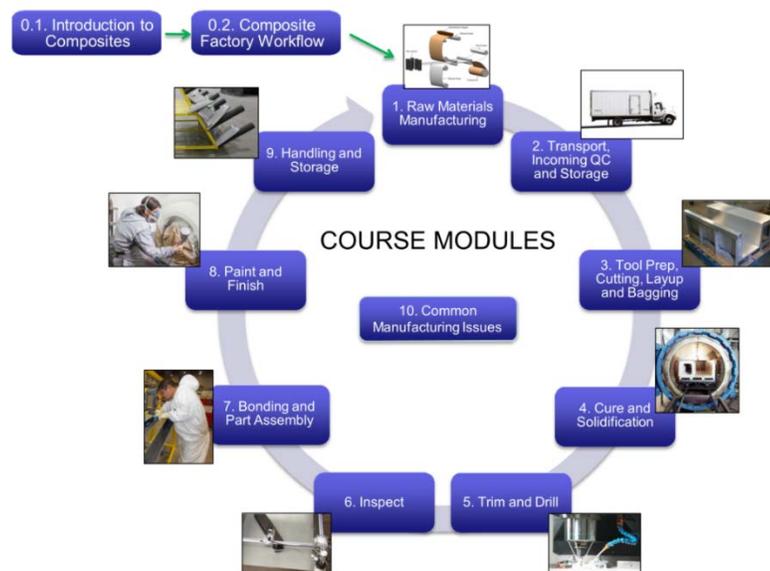
# Composites Manufacturing Technology Safety Awareness Course

## Course Description

This course provides manufacturing professionals with a technical background of composites manufacturing to a level that allows them to better and more proactively identify the deficiencies on the factory floor that have safety implications

## Course Organization

The course content is organized into ten lesson modules addressing different aspects of the composites manufacturing technology. In addition, two pre-requisites modules covering introductory content about composites are included. An optional hands-on lab is offered twice a year during the first week of May and October.



The online course is designed to be completed sequentially, except for the lab course.

## Course Schedule

The self-paced courses will be available at the beginning **September 15<sup>th</sup> to December 30<sup>th</sup> during Fall 2022**. The students may begin (no later than November 30<sup>th</sup>) and complete the course during this time period. The estimated time for completing the course is about **60** hours.

## Course Activities and Expectations

The course activities include watching interactive lecture videos, reading course notes and reflecting on the course topics, assessing your understanding using quizzes, and sharing your experiences in context of the course by posting to the discussion boards. The students have to achieve a score of 80% or higher in each assessment activity (quizzes, discussion board) to progress and complete the course. The assessment activities include online quizzes (x12) and multi-topic discussion boards (x3). The list of course activities and assessments which the students have to complete sequentially are listed below.

### 1. Orientation

Learn course navigation; Review course syllabus and expectations  
Introduce yourself on Discussion Board

### 2. Lesson 0.1 : Introduction to Composites

Watch lecture video, review course notes; Complete Quiz 0.1

### 3. Lesson 0.2 : Composites factory Workflow

Watch lecture video, review course notes; Complete Quiz 0.2

### 4. Lesson 1 : Raw Materials Manufacturing

Watch lecture video, review course notes; Complete Quiz 1

### 5. Lesson 2 : Transport, Incoming QC and Storage

Watch lecture video, review course notes; Complete Quiz 2

### 6. Lesson 3 : Tool Preparation, Cutting, Layup and Bagging

Watch lecture video, review course notes; Complete Quiz 3

### 7. Discussion Board Activity-1

Post to discussion board on choice of listed topics

### 8. Lesson 4 : Cure and Solidification

Watch lecture video, review course notes; Complete Quiz 4

### 9. Lesson 5 : Trim and Drill

Watch lecture video, review course notes; Complete Quiz 5

### 10. Lesson 6 : Inspect

Watch lecture video, review course notes; Complete Quiz 6

### 11. Discussion Board Activity-2

Post to discussion board on choice of listed topics

### 12. Lesson 7 : Bonding and Part Assembly

Watch lecture video, review course notes; Complete Quiz 7

### 13. Lesson 8 : Paint and Finish

Watch lecture video, review course notes; Complete Quiz 8

### 14. Lesson 9 : Handling and Storage

Watch lecture video, review course notes; Complete Quiz 9

### 15. Lesson 10 : Common Manufacturing Issues

Watch lecture video, review course notes; Complete Quiz 10

### 16. Discussion Board Activity-3

Post to discussion board on choice of listed topics

## Learning Modules

### **0.1 Introduction to Composites**

Students will be provided with composite materials technologies basic knowledge, in preparation for the follow-on modules

### **0.2 Composites Factory Workflow**

This module will give the student an overview of different forms of composites manufacturing and various factory workflows. The emphasis will be on the fundamental processing steps that are common within various manufacturing processes.

#### **1 Raw Materials Manufacturing**

This module contains a review of the manufacturing processes of composite constituents and composite forms. The emphasis will be on the effect of the initial materials and their forms on the subsequent properties and performance of the final part.

#### **2 Transport, Incoming Quality Control and Storage**

This module will cover the fundamental impact of the environmental conditions (temperature, moisture, etc.) on the quality of the materials. The emphasis will be on how to control those environmental conditions through procurement specifications, material specifications, batch testing, etc., such that the material quality at production is consistent with design assumptions.

#### **3 Tool Preparation, Cutting, Layup and Bagging**

This module discusses the relationship between tool preparation, cutting, layup and bagging on the quality of manufactured parts. Use of process control documents to standardize practices leading up to cure is also emphasized

#### **4 Cure and Solidification**

This module discusses the nature of cure or solidification, how it is dependent on time and temperature, and the effect on mechanical and physical properties of the finished component. The importance of consolidation with the aid of vacuum and external pressure on mechanical properties will also be emphasized.

#### **5 Trim and Drill**

This module discusses the differences between machining composites versus metals, and the importance of proper techniques to avoid mechanical and heat damage in the composite structure.

## Learning Modules

### **6 Inspect**

This module discusses the most common NDI techniques and how to assess the appropriateness of the technique and NDI setup for a given application. There is some form of quality inspection performed at each stage in a manufacturing process (visual inspection at minimum). Each module of this course will introduce module specific inspection techniques and practices. This module covers in greater detail overall part quality investigations performed as an independent step in the manufacturing process.

### **7 Bonding and Part Assembly**

This module describes the importance of critical steps in bonding and assembly of composite components. Emphasis is placed on the importance of surface preparation for adhesive joints.

### **8 Paint and Finish**

This module discusses ensuring that any finishing technique is properly tested and qualified against appropriate control documents and that any finishing product is properly controlled in terms of storage shelf life and proper application technique. Emphasis is also given to lightning strike protection techniques.

### **9 Handling and Storage**

This module discusses the importance of safe handling and storage procedures and the impact of potential damage on typical composite aircraft parts.

### **10 Common Manufacturing Issues**

This module presents practical examples of where manufacturing practices can lead to defects and other safety issues with production parts. The emphasis is on understanding the root cause of the defect and the appropriate corrective actions that are required.